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Gamma Spectroscopy of Hf-178m2 Using Synchrotron X-rays

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Beamline(s): X15A

Introduction: Preliminary experiments have been performed to examine the triggering of gamma emissions from the 31-year Hf-178m2 isomer using intense monochromatic X-rays from the X15A beamline at the National Synchrotron Light Source at Brookhaven National Laboratory.

Methods and Materials: A Hf-178m2 target in a sealed polycarbonate source holder was placed in the beam. Data were collected with a germanium gamma detector. Initial trials were performed to probe incident photon energies over the L1, L2, and L3 X-ray edges of hafnium and the 12 - 13 keV region.

Results: No resonances larger than 10^{-25} cm²-keV (minimum detectable level) were detected.

Conclusions: Further experiments are required to evaluate triggered emissions. Two are currently being planned for the NSLS at BNL. In the first, a Hf-178m2 target will be exposed to the X17B beamline for the maximum possible duration. Extensive activity surveys before and after the beam exposure will determine if any material was "burned up" due to triggered emissions. In the second experiment, a Hf-178m2 target will be exposed to a white beam in X15A.

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References: *Accelerated Emission of Gamma Rays from the 31-year Isomer of ¹⁷⁸Hf Induced by X-Ray Irradiation*, Physical Review Letters 82:4, 695 (25 January 1999).